Natural resources as an area of protection in LCA - outcomes of the discussion by the working group on resources within the UNEP-SETAC Life Cycle Initiative

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ABSTRACT BOOK

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expected. The CFs are mode of impact specific and spatially differentiated according to the large marine ecosystem (LME) biogeographical system and seabed substrate. Given that most anthropogenic seabed damage occurs within continental shelf areas, our developed methodology is applicable for the global extent of the 66 LME units, which covers all continental shelf areas globally. For the first time we are able to account for biodiversity impacts of seabed damaging activities within LCA on a global scale (LME) and at endpoint level.

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Habitat suitability: water use impact assessment for ecosystems beyond counting species

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Assessment of water-use impacts on ecosystem quality in LCA is a relatively recent research domain and still undergoing continuous development. The most recent approaches develop characterization factors by differentiating *fate*, *exposure*, and *effect factors* for distinct water sources and ecosystems. Even though, there is no consensus about what are the midpoint and endpoint indicators to be chosen to better represent impacts on the *Ecosystem Quality* area of protection. Current methods are based on describing ecosystem quality by means of biodiversity loss indicators. If choosing such type of endpoint unit allows a straightforward representation of results, they still carry a lot of uncertainty due to difficulties in isolating direct causal relationships between fate and effect factors, and between midpoint and endpoint indicators. Moreover, most of the methods face problems of data availability, along with a limited spatial coverage. This raises the question whether species loss is suitable and representative for describing freshwater ecosystem quality in LCA. Adopting species-loss-based indicators for water-use impacts on ecosystems, conceptually conflicts with the natural behaviour of aquatic ecosystems, where species disappearance usually occurs in case of extreme or long term habitat alteration instead of marginal changes. Therefore, the dynamics of stressors should be characterized in order to assess impacts of water use. Eco-hydrological methods identify variations of ecologically significant parameters of flow regimes related to ecological responses in freshwater habitats. Microhabitat simulation methods are used to build habitat suitability curves for single or grouped fish species based on these variations. This study is aimed at developing an effect factor based on eco-hydrological approaches. We present first results showing the application in a selected case study in France. Going beyond indicators of species richness allows to isolate the cause-effect chain between water deprivation and ecological response from other stressors. The potential change in habitat suitability could be used as a proxy to indicate the response to habitat change for target species. Building an impact assessment method on significant relationships between freshwater ecosystems and environmental flows may ultimately require a translation into biodiversity metrics to allow a straightforward comparison and aggregation of results with other impact categories and pathways.

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The topic of resources as an area of protection (AoP) in life cycle assessment (LCA) is being discussed within an expert group under the umbrella of the Life Cycle Initiative by the United Nations Environment Programme (UNEP) and the Society for Environmental Toxicology and Chemistry (SETAC). The AoP 'Natural Resources' is neither well defined nor agreed upon. Furthermore, there is currently no life cycle impact assessment (LCIA) method available that is able to consistently assess impacts at midpoint and endpoint level across different resource categories (minerals/metals and fossil fuels, water, land/soil, biotic resources like wild plants and animals). Definitions and categorizations of natural resources differ and there is no agreement on what methods should be considered midpoint or endpoint methods because there is no agreement (at midpoint and endpoint) on what impact should be assessed (is it reduced availability, is it depletion, is it increased energy use or costs due to future resource extraction, etc.?). The merit of this working group is the broad analysis of available methods considering different resources and their integrated discussion according to the methods' underlying principles (e.g. use-to-availability ratios, backup technology approaches, etc.). This is the basis on which recommendations for best practice with existing methods and indications for further research and development will be given. At the time of the SETAC 2016 conference, the group should have these recommendations ready.

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Interpretation of LCA results: significant issues also informed by the environmental footprints pilots

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According to ISO 14040 interpretation is the phase of LCA in which the findings from the inventory analysis and the impact assessment are considered together; it should deliver results that are consistent with the defined goal and scope and which reach conclusions, explain limitations and provide recommendations. ISO 14044 further specifies that interpretation comprises the following elements: i) identification of the significant issues based on the results of the LCI and LCIA phases of LCA; ii) an evaluation that considers completeness, sensitivity and consistency checks; iii) conclusions, limitations, and recommendations. The Product Environmental Footprint (PEF) Guide [1] explains that interpretation of the results of a PEF study serves two purposes: i) to ensure that the performance of the PEF model corresponds to the goals and quality requirements of the study; in this sense, PEF interpretation may inform iterative improvements of the PEF model until all goals and requirements are met; and ii) to derive robust conclusions and recommendations from the analysis, for example in support of environmental improvements. Within the work done in support to PEF/OEF, the JRC has perfomed some studies and some tests in order to identify the most relevant issues to be considered in the interpretation phase. The final aim of this work is to gain insights on cross-cutting issues affecting all the phases of a life cycle study and to provide guidance and support to practitioners and researchers in the intepretation phase. The presentation will show and discuss the results of some preliminary tests done within this framework including 1. the influence to final results of the selection and the modeling assumptions in secondary inventory dataset; 2. sensitivity analysis of impact assessment modeling; 3. sensitivity analysis of normalisation, including uncertaitnty analysis; and 4. sensitivity analysis of weighting.

Passive sampling of organic micropollutants and toxicity assessment: opportunities, challenges and innovations (I)

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Detecting POPs profiles across the Atlantic Ocean using polyethlyene samplers

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Little is known of the distribution of persistent organic pollutants (POPs) in the deep ocean. Polyethylene passive samplers were used to detect the vertical distribution of truly dissolved POPs at two sites in the Atlantic Ocean. Samplers were deployed at five depths covering 26-2535 m in the northern Atlantic and Tropical Atlantic, in approximately one year deployments. Samplers of different thickness were used to determine the state of equilibrium POPs reached in the passive samplers. Comparable sampling rates were obtained from model derived results (5 & 4 L/day) and performance reference compounds derived results (8.7 & 4.9 L/day). Concentrations of POPs detected in the North Atlantic near the surface (e.g. $\sum_{14}$PCB: 0.84 pg L^{-1}) were similar to previous measurements. Currents seemed more important in moving POPs to deeper water masses than the biological pump. The ratio of PCB concentrations in near surface waters (excluding PCB-28) between the two sites was inversely correlated with congeners' sub-cooled liquid vapour pressure, in support of the latitudinal fractionation. The results presented here implied a significant amount of HCB is stored in the Atlantic Ocean (4.8-26 % of the global HCB environmental burdens), contrasting traditional beliefs that POPs do not reach the deep ocean.

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Vertical distribution of organic contaminants in harbour waters assessed by passive sampling

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Coastal and estuarine areas receive contaminants from wastewater discharges and littoral activities such as boating, sea trade and fisheries as well as from upstream inputs through riverine discharges and soil washout. Assessing the distribution of these contaminants in water bodies provides insights for the understanding of their sources and fate, hence allowing a better management of our waters. In particular, a vertical profile of pollutants can indicate sources originating from the water